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HOMING IN ON DARK ENERGY

Press conference to feature Supernova Cosmology Project results from Hubble Space Telescope

NASHVILLE, TN—At a press conference at the American Astronomical Society's 202nd annual meeting, to be held Monday morning, May 26, researchers from the Supernova Cosmology Project (SCP) headquartered at Lawrence Berkeley National Laboratory in Berkeley, CA, will discuss what SCP leader and Berkeley Lab astrophysicist Saul Perlmutter calls 'a strikingly beautiful data set' bearing on the nature of dark energy.

The Supernova Cosmology Project is an international consortium of researchers from institutions in the United States, France, Japan, Spain, Sweden, the United Kingdom, and Chile. Their newest findings, presented this week at the Astronomical Society meeting, are based almost entirely on supernovae studied with NASA's Hubble Space Telescope (HST).

SCP member Robert A. Knop, assistant professor of physics and astronomy at Vanderbilt University in Nashville, will present the results of the data analysis he led. Measurements of light curves and spectra from 11 distant Type Ia supernovae are included in the data set, the largest such set collected solely from space.

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The new results are in impressive agreement with the conclusions of earlier supernova observations, announced in 1998 by the SCP and the competing High-*z* Supernova Search Team, that the universe is expanding at an accelerating rate. Moreover, the new results yield more precise bounds for several critical cosmological parameters, including the mass density and the density of dark energy in the universe. The study suggests that approximately 25 percent of the universe's density consists of matter (of all types) and that 75 percent of its density is due to the mysterious dark energy.

When combined with recent measurements of the cosmic microwave background and galaxy clusters, these results tighten the value of the equation of state that characterizes dark energy, assuming it is constant over time. The value is close to minus one, and is consistent with a "cosmological constant" form of dark energy, which Einstein invented – and famously rejected. However, the new data are also consistent with a wide variety of alternative models, including those that allow the dark energy to vary with time.

Because the space telescope avoids atmospheric effects, these supernova observations have a much higher signal-to-noise ratio and much greater spatial resolution than those made with ground-based telescopes. Consequently they offer greatly improved color measurements of distant supernovae.

'These HST data provide a strong test of host-galaxy extinction,' says Knop, referring to concerns that ordinary dust in distant galaxies absorbs and reddens the light of supernovae enough to introduce systematic bias. Because the new HST data show no anomalous reddening with distance, says Knop, the supernovae 'pass the test with flying colors.'

The 11 new Type Ia supernovae form a completely independent data set, statistically as strong as sets of dozens of supernovae acquired with ground-based telescopes on which previous conclusions were based. That some unknown dark energy is accelerating the expansion of the universe thus has a 99.9 percent probability—and higher still, when the other types of measurements are combined with the supernova measurements.

The press conference, titled 'Distant supernovae and what they tell us: pinning down dark energy with observations of far-off stellar explosions,' will be held at 9:30 a.m. Central Daylight Time in Room 201, Nashville Convention Center, 601 Commerce Street, Nashville, TN 37203. In addition to Perlmutter and Knop from the Supernova Cosmology Project, the press conference will include Robert P. Kirshner of the Harvard-Smithsonian Center for Astrophysics, a member of the High-z Supernova Search Team.

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